

## LIFE ISSUES IN AMTEC CELLS

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A review of life and performance issues investigated by the Jet Propulsion Laboratory, California Institute of Technology, for the electrode, solid electrolyte and other components of AMTEC cells for space power conversion will be presented. A life model of electrode grain growth and performance will be described, along with experimental results. Life data on the solid electrolyte conductivity at typical AMTEC operating temperatures of 1100- 1200K will also be described. These results indicate that with judicious selection of components and operating temperatures, operation of AMTEC cells at high power densities and efficiencies for periods greater than five years is an attainable goal.

The work described in this paper was carried out at the Jet Propulsion laboratory, California institute of Technology, under a contract with the National Aeronautics and Space Administration. It reviews work on AMTEC cells carried out at JPL during 1984 to 1994. The original references in the bibliography list all sponsoring agencies and contributing authors.

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### AREAS OF INVESTIGATION AT JET PROPULSION LABORATORY

1. Basic model of AMTEC electrode performance
  - a. Degradation of oxidized molybdenum and tungsten electrodes
  - b. Model for transport and kinetics in AMTEC electrodes
  - c. Tunneling model for electrode exchange current
2. Electrode life experiments and model
3. Electrolyte conductivity and life experiments
4. Other life issues

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### CONCLUSIONS

1. Basic model of AMTEC electrode performance has been developed.
  - a. Oxidized molybdenum and tungsten electrodes not suitable.
  - b. Transport / kinetics model for AMTEC electrodes developed.
  - c. Tunneling and resorption model fits electrode exchange current.
2. Electrode life satisfactory.
  - a. Molybdenum electrodes below 1100K for > 10 years.
  - b. Tungsten/platinum and tungsten/rhodium electrodes to 1200K.
3. Electrolyte performance and life appear satisfactory; longer tests needed.
4. Hot alkali containment and seals require more work although performance for > 2000 hours is satisfactory. Detailed life modelling of these components is also needed.